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Report of Potential Applications of Voice Technology to Armor Training

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for

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19. ABSTRACT (Continue on reverse if necessary and identify by block number) This report presents potential applications of current low-risk voice technology to military instruction. Three programs of instruction were analyzed to select specified training tasks that might benefit from the use of this technology. In general, two classes of tasks were identified as potential candidates. The first class consists of those tasks that have a high oral content and are good candidates for computer-based instruction and interactive video instruction. The second class consists of tasks requiring trainees to interact directly with non-computer materials. Using voice technology would allow trainees to interact with computer systems and still have hands and visual attention free to manipulate the materials.					
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REPORT OF POTENTIAL APPLICATIONS OF VOICE TECHNOLOGY TO ARMOR TRAINING

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REPORT OF POTENTIAL APPLICATIONS OF VOICE TECHNOLOGY TO ARMOR TRAINING

INTRODUCTION

This report outlines potential applications of voice technology to the training represented in the Programs of Instruction (POIs) for the Basic Non-Commissioned Officers Course (BNCOC), the Advanced Non-Commissioned Officers Course (ANCOC), and the Armor Officers Basic (AOB) Course. These courses are only beginning to take advantage of current training technology.

Voice technology consists of two types of systems that may be relevant to training. The first is voice (speech) recognition technology, which is concerned with the recognition of human speech by general purpose computers or dedicated devices. Researchers and companies are exploring a variety of ways of accomplishing this. They range from extremely complex and expensive systems (Erman et al., 1980) to small microcomputer-based ones. Larger, more accurate, and more expensive solutions generally use artificial intelligence (AI) techniques to parse utterances and restrict the set of possible words to be recognized.

The second type of system is voice response technology, which is concerned with the production of speech and other sounds by computers and other machines. Voice response systems use either a digital encoding technique or a voice synthesis technique (Lee & Lochovsky, 1984.)

Current voice and computer-based instruction technologies are not accurate or fast enough yet to be useful for all types of training. We must examine training requirements carefully to identify areas where voice technology can be combined with computer-based instruction to provide better training than is currently being done. The review should be based on understanding the capabilities and limitations of current voice systems in both recognizing and producing speech, of CBI systems, and of the CBI development process.

Computer voice recognition remains relatively rudimentary. Although large, expensive systems can accurately recognize hundreds or thousands of words and can even use artificial intelligence techniques to "understand" some speech, the low-cost, low-risk systems that are available are less capable. Typically, such systems recognize 75-100 words accurately after having been "trained" by individual speakers. The systems tend to be

slow, so that fast continuous speech can easily overload them. Unless backed up by large computer systems running artificial intelligence programs they cannot parse the incoming speech or understand it in any meaningful way. Therefore, realistic applications for current low-risk voice technology are limited to recognizing a small number of possible words or phrases and taking the unambiguous actions associated with those words.

Voice response technology is more advanced. There are several ways of recording voices for later random access and playback, including both analog and digital techniques. The storage media (such as floppy disks, hard disks, and optical disks) for voice playback can hold large amounts of information, so the amount of speech which can be produced is abundant. A possible limitation is the speed of access. Typically, specific speech segments can be located and played within a few seconds or less. This is fast enough for most situations, but applications requiring extremely fast responses will not be well-served by the technology.

Voice Recognition Criteria.

The following criteria can help define the types of objectives and training requirements that might be well-served using voice recognition technology.

- 1) Oral or Manual Content. To make voice recognition useful, the training objectives should usually require producing oral commands or communications. Examples are found in areas where commands or communications must be produced orally in actual practice. In contrast, if equal training results can be produced by having the student type, point to, or otherwise indicate his answer silently, then voice technology may not be cost-effective. Voice recognition should generally be integral to the instruction, not merely adjunct to it. The content areas in BNCOG, ANCOC, and AOB that fit this criterion are discussed in Appendix A of this report.

The possible exceptions to this requirement are situations in which the target population consists of people who must enter and receive information by voice. For example, those who cannot read the language of the materials well enough or type and point accurately, may benefit from the use of voice input and output devices.

There are situations in which manual input may be difficult or impossible. For example, if a trainee must handle a piece of machinery in order to learn to maintain it, it might be useful to provide the necessary interactions with voice input and output. The content areas that fit this criterion are discussed briefly in Appendix B of this report. There are maintenance tasks and others requiring the direct manipulation of objects in training.

- 2) CBI Appropriateness. The training objectives and requirements should be appropriate to a CBI environment. If the training must be done in the field or with actual equipment, then the voice/CBI combination may not be useful. However, a voice/CBI/video system can be used to simulate equipment used in many field situations.

- 3) Need for Practice. The training objectives should include skills and knowledge requiring practice to master. Materials easy enough for a learner to master in one step (from reading, listening, etc.) are not cost-effective to produce as CBI.
- 4) Number of Situations. The number of situations should be limited to a few hundred. Too many possibilities may present serious difficulties in developing and managing CBI. Developing CBI and interactive video already requires coordinating many people, media and schedules. Adding voice technology increases the complexity significantly. The more situations that must be taught, the more difficult development will become, with a concomitant increase in cost and risk.
- 5) Lack of Ambiguity. All of the situation types should have clear differences between the correct and incorrect oral responses associated with them. There is little room for ambiguity in CBI. In order for the computer to judge the accuracy of a response and make a decision based on that judgement, all possibilities must be anticipated and provided for. This is not possible with many ambiguous situations requiring unpredictable human interaction. Such situations are not good candidates for CBI or voice technology training. Another type of ambiguity to avoid is that found in homonyms and near-homonyms, which cannot easily be distinguished by computer voice recognition systems.
- 6) Number of Words. The number of words or short phrases that the voice technology system is required to recognize should be restricted to 75-100 or fewer. However, some systems can recognize many different sets of phrases, each one containing 75-100 phrases. Each set must be used separately and independently, so the recognition phrases should be categorizable into distinct groups with 75-100 or fewer elements. Different sets can be used in different phases of the instruction.
- 7) Response Speed. The speed of both voice recognition and response is limited. Situations that require the system to respond instantaneously are not appropriate. Pauses of a few seconds should be tolerable.

Voice Response Criteria.

There are two major criteria for using voice response technology different from the audio playback available from conventional videodisks. First, the situations must require voice or other sound responses as part of a realistic situation or simulation. Ideally, the situations being taught would require extensive discrimination and generalization training on the sounds to be produced. Second, the requirement for voice production must be separate from any requirements for video and its accompanying audio. This might occur either because video is not required at all or because different audio segments must appear at different times with the video.

Potential Applications.

The potential applications shown in this document represent a range of possibilities. Some possible applications were rejected early even though they required oral communications and commands. These were clearly inappropriate for computer-based training because of the extreme ambiguity found in the situations being taught. Of the applications presented here, some are clearly good candidates for training using voice technology systems, while others may be marginal candidates. The use of voice technology in any of these training tasks depends on the success and lessons of the BNCOC courses on Military Communications and Fire Commands now being developed.

General Procedures for Applying Voice Technology.

Because all the applications discussed here were chosen based on SSI's experience and research, the comments we have about the hardware and software requirements and the recommended procedures for applying voice technology are general across all of them. These issues are discussed below.

Recommended Technology.

Most of the applications discussed here require a voice recognition system that can recognize 75 to 100 words or phrases quickly and with high accuracy. The voice response system must generally be able to produce different voice response segments with random access within a second or two.

SSI has chosen the voice technology systems available from Votan Corporation. The VTR 6000 and VTR 6050 are RS-232 compatible and therefore can be used with any

computer system supporting this interface. They meet all the criteria set forth here.

First, the VTR 6000 is an integrated unit that can do both the voice recognition and the voice response functions that we require. Thus, we need to interface only one extra system to MicroTICCIT.

From demonstrations and the available technical information, it appears that the capabilities and response speed of the VTR 6000 meet the requirements of this project. Among these capabilities are the ability to recognize up to 75 speaker-dependent, continuously-spoken words after only two training trials and the ability to produce relatively high quality digitized voice responses.

The VTR 6000 is a stand-alone device that can be installed with each IBM PC terminal used in the TICCIT system. This makes interfacing it with TICCIT relatively easy, since the voice system ignores all information passing through it except the control codes specific to its operation. According to Votan, all that is required is the development of small programs that send these control codes.

The Voice Data Entry System from Keytronics, Inc. of Spokane, Washington is also available. The company claims better than 98% speaker-dependent recognition accuracy and a vocabulary of 100 words or phrases. In this system, the voice recognition algorithms reside in the keyboard which then translates voice commands to keystrokes; the computer never "knows" it is attached to a voice recognition system. However, it includes no voice response capabilities, and another device would be required if such capabilities were needed.

Scientific Systems has investigated other voice recognition systems that were not appropriate for this project. The speech recognition board for the IBM-PC from Tecmar, Inc., of Solon, Ohio does not have provisions for speaker-dependent recognition from multiple speakers, and Texas Instruments' Speech Command appears to be available only for the Texas Instruments' Professional Computer.

Although these systems represent a good sample of what was available when SSI did its survey, it should be noted that these technologies are changing quite rapidly. New systems and models have been introduced since SSI identified the one to be used in the Voice Technology project. If other projects using voice technology are planned, it is recommended that new attempts be made to identify appropriate voice systems. There will undoubtedly be new ones on the market by then.

Cost Estimates.

A voice recognition and response system like that described here currently costs \$4000 to \$6000, depending on the exact features and interfacing required. The VTR 6050 from Votan, although more expensive in initial cost, incorporates features like an internal microfloppy disk drive that could save a great deal of time in interfacing the voice technology to the host system. Other systems are likely to be comparable in price. However, prices are dropping rapidly, so future projects must attempt to identify appropriate cost-effective systems for their needs.

The major software cost in developing instruction using voice technology is the effort required to interface the voice system to the host computer. Some of the tasks that must be accomplished by the software include sending control codes to the voice system, storing and retrieving voice parameters for each student, and storing and retrieving voice response segments. Many of these functions can be done internally by the voice system itself if the needed features are present. For example, the VTR 6050 stores all parameters and responses on its own disk drive. Therefore, the only interfacing problem is that of sending the correct control codes to activate the voice technology system. This drastically cuts the cost of software development.

Summary and Conclusions

This part of the voice technology project identified potential applications for current low-risk voice technology in armor training. SSI used the Programs of Instruction for the BNCOC, ANCOC, and AOB courses to pick out specific training tasks that might benefit from the use of this technology.

In general, we found two classes of tasks that are potential candidates. The first class consists of those tasks which have a high oral content to begin with and that also are good candidates for CBI and interactive video instruction. This class includes the two tasks—Direct Fire Commands and Military Communications—for which SSI is currently developing courseware. If these first two demonstration courses perform as expected, then many of the other tasks in this class will become prime candidates for similar course development.

The second class consists of tasks in which it is highly desirable to have trainees interact directly with materials off the computer. These include things like maintenance tasks in which trainees should, at some point in their training, have "hands on" experiences with the systems they are learning about. Using voice technology would allow a trainee to interact with a CBI or interactive video system and still leave his hands and visual attention free to manipulate the materials. No demonstrations of the usefulness of this type of training have been made. It might be desirable to do so to help establish its effectiveness, efficiency, and limits.

References.

1. Erman, L.D., Hayes-Roth, F. Lesser, V.R., & Reddy, D.R. The HEARSAY-II speech understanding system: Integrating knowledge to resolve uncertainty. ACM Computing Surveys, 12, 1980, 213-253.
2. Lee, D.L. & Lochovsky, F.H. Voice response systems. ACM Computing Surveys, 15, 1984, 351-374.

Appendix A

Potential Applications for Voice Technology Systems in Armor Training

Appendix A of the report presents 13 potential applications for voice technology in armor training. These applications were taken from the Programs of Instruction for the Basic Non-Commissioned Officers Course (BNCOC) from June, 1983, the Advanced Non-Commissioned Officers Course (ANCOC, no date), and the Armor Officer Basic (AOB) Course (no date). Members of SSI's technical staff reviewed the programs of instruction and selected potential applications based on the criteria presented above. These criteria are laid out clearly with each potential application and include the oral content of the task, the appropriateness of the task for CBI, the need for practice, the number of situations and words to be taught, the ambiguity of the task, and the response speed needed. Some of the training tasks identified have a high potential for benefitting from the use of voice technology in CBI and interactive video instruction. Others are marginal.

Potential Applications for Voice Technology
During Armor BNCOC Training

Potential Application:

Task Cluster Annex E C30 Military Communications
Tasks: 031-503-1705
113-573-4002
113-571-1003
113-573-8006

Subject Matter:

Using the automated CEOI and a standard
military radio to send and receive
coded messages.

Evaluation of Voice Technology Appropriateness

Voice Recognition:

Oral Content: Medium
CBI Appropriateness: High
Practice: High
Number of Situations: Manageable if restricted
Lack of Ambiguity: Medium
Number of Words: Acceptable if restricted
Response Speed: Acceptable

Voice Response:

Oral Content: Medium
Independence from video: High

Justification for Using Voice Technology:

This is one of the demonstration courses
being developed by Scientific Systems. It
meets most of the important criteria for
using voice technology, especially since SSI
is carefully limiting the words and situations
to be used.

Potential Application:

Task Cluster Annex G C37 Prepare and Issue Oral
Operation Order

Task: 171-326-5626

Subject Matter:

After being given an oral command by
his platoon leader, the TC must prepare
and issue an oral operation order. It
must be clear, concise, and standard.

Evaluation of Voice Technology Appropriateness

Voice Recognition:

Oral Content; High

CBI Appropriateness: Medium

Practice: High

Number of Situations: Very Large

Lack of Ambiguity: Poor, can be very ambiguous

Number of Words: Very Large

Response Speed: Acceptable

Voice Response:

Oral Content: High

Independence from video: Medium

Justification for Using Voice Technology:

This task is only marginally appropriate for the
use of voice technology in training. This is
because of the high degree of ambiguity in the
large number of situations and the many possible
words that would have to be recognized. Future
voice technology and computer answer-judging may
make it possible to do this kind of project better.

Potential Application:

Task Cluster Annex I WPN7 Direct Gunnery Engagements
Tasks: 171-126-3010
171-126-3009
071-313-3472

Subject Matter:

Issuing appropriate fire commands for
the main gun, the coaxial machine gun,
and the .50 caliber machine gun.

Evaluation of Voice Technology Appropriateness

Voice Recognition:

Oral Content: High
CBI Appropriateness: High
Practice: High
Number of Situations: Manageable
Lack of Ambiguity: Good
Number of Words: Within system limits
Response Speed: Probably Acceptable

Voice Response:

Oral Content: Medium
Independence from video: High

Justification for Using Voice Technology:

This is one of the demonstration courses
being developed by Scientific Systems. It
meets most of the important criteria for
using voice technology, especially since SSI
is carefully limiting the words and situations
to be used.

Potential Applications for Voice Technology Systems
During Armor ANCOC Training

Potential Application:

SN.20203 Call for indirect fire support, conduct
corrections for mortar and field artillery
fire

Task: 171-123-1020

Subject Matter:

Call for and correct mortar and field
artillery fire for suppression and area
fire.

Evaluation of Voice Technology Appropriateness

Voice Recognition:

Oral Content: High

CBI Appropriateness: High

Practice: High

Number of Situations: Manageable if restricted

Lack of Ambiguity: Good

Number of Words: Manageable

Response Speed: Probably Acceptable

Voice Response:

Oral Content: Medium

Independence from video: High

Justification for Using Voice Technology:

Calling for and directing indirect fire is
similar to the BNCOC task of giving fire
commands while directing tank engagements.
This task should prove to be appropriate
for the use of voice technology in training.
Like the other task, this one meets most of
the important criteria when the possible
situations are carefully controlled.

Potential Application:

SN.60102 Command and control of troops, lead troops,
give various kinds of orders

Tasks: 171-123-1010
071-326-5626

Subject Matter:

Preparing and issuing oral operations
orders, fragmentary orders, and warning
orders.

Evaluation of Voice Technology Appropriateness

Voice Recognition:

Oral Content: High
CBI Appropriateness: Low
Practice: High
Number of Situations: Very Large
Lack of Ambiguity: Poor, Very Ambiguous
Number of Words: Very Large
Response Speed: Acceptable

Voice Response:

Oral Content: Medium
Independence from video: High

Justification for Using Voice Technology:

This task is only marginally appropriate for the
use of voice technology in training. This is
because of the high degree of ambiguity in the
large number of situations and the many possible
words that would have to be recognized. Better
voice technology and computer answer-judging may
allow us to use voice technology for this type
of training in the future, however.

Potential Application:

WN.23708 Platoon Fire Control, give correct platoon
level fire commands

Task: 171-123-4001

Subject Matter:

Issuing target acquisition reports and
platoon fire commands.

Evaluation of Voice Technology Appropriateness

Voice Recognition:

Oral Content: High

CBI Appropriateness: High

Practice: High

Number of Situations: Large

Lack of Ambiguity: Acceptable

Number of Words: Medium

Response Speed: Probably Acceptable

Voice Response:

Oral Content: Medium

Independence from video: High

Justification for Using Voice Technology:

This task is similar to the task of
issuing individual tank fire commands.

It may be more complex in some ways,
but still appropriate for voice technology.

Potential Application:

CN.61105 Communications procedures, CEOI and radio
net use

Tasks: 113-571-1003
113-573-8006

Subject Matter:

Using the automated CEOI and a standard
military radio to send and receive
coded messages.

Evaluation of Voice Technology Appropriateness

Voice Recognition:

Oral Content: Medium

CBI Appropriateness: High

Practice: High

Number of Situations: Manageable if restricted

Lack of Ambiguity: Medium

Number of Words: Acceptable if restricted

Response Speed: Acceptable

Voice Response:

Oral Content: Medium

Independence from video: High

Justification for Using Voice Technology:

This is very similar to one of the BNCOC
task clusters for which SSI is developing
instruction. Voice technology should be
equally useful here. The justification is
the same.

Potential Applications for Voice Technology Systems
during Armor AOB Training

Potential Application:

SA.20204 Call for and adjust indirect fire

Task: 03-2830.00-6003

Subject Matter:

Call for and correct mortar and
field artillery fire for suppression
and area fire.

Evaluation of Voice Technology Appropriateness

Voice Recognition:

Oral Content: High

CBI Appropriateness: High

Practice: High

Number of Situations: Manageable if restricted

Lack of Ambiguity: Good

Number of Words: Manageable

Response Speed: Probably Acceptable

Voice Response:

Oral Content: Medium

Independence from video: High

Justification for Using Voice Technology:

Calling for and directing indirect fire is
similar to the BNCOC task of giving fire
commands while directing tank engagements.
This task should prove to be appropriate
for the use of voice technology in training.
The number of situations and commands would
probably have to be restricted.

Potential Application:

SA.60103 Prepare/Issue platoon operations order

Task: 01-3140.00-0001

Subject Matter:

Eight troop leading procedures,
planning tactical operations, and
preparing combat orders.

Evaluation of Voice Technology Appropriateness

Voice Recognition:

Oral Content: High

CBI Appropriateness: Medium

Practice: High

Number of Situations: Very Large

Lack of Ambiguity: Poor, Very Ambiguous

Number of Words: Very Large

Response Speed: Acceptable

Voice Response:

Oral Content: Medium

Independence from video: High

Justification for Using Voice Technology:

This task is only marginally appropriate for the use of voice technology in training. This is because of the high degree of ambiguity in the large number of situations and the many possible words that would have to be recognized. Future technology in voice recognition and computer answer judging might allow us to use voice technology systems for this training, however.

Potential Application:

WA.22028 Conduct of Fire Commands

Tasks: 01-1211.00-1053
01-1222.00-1010-D
01-1222.00-1006-D
01-1222.00-1013-D
01-1222.00-1008
01-1223.00-1005-D
01-1223.00-1006-D

Subject Matter:

Issuing appropriate fire commands for
the main gun, the coaxial machine gun,
and the .50 caliber machine gun.

Evaluation of Voice Technology Appropriateness

Voice Recognition:

Oral Content: High
CBI Appropriateness: High
Practice: High
Number of Situations: Manageable
Lack of Ambiguity: Good
Number of Words: Within system limits
Response Speed: Probably Acceptable

Voice Response:

Oral Content: Medium
Independence from video: High

Justification for Using Voice Technology:

This is similar to one of the BNCOC
task clusters for which SSI is already
developing instruction. It should be
appropriate for the use of voice
technology. The justification is similar.

Potential Application:

WA.24608 Platoon Fire commands

Task: 171-123-4004

Subject Matter:

Issuing target acquisition reports and
platoon fire commands.

Evaluation of Voice Technology Appropriateness

Voice Recognition:

Oral Content: High

CBI Appropriateness: High

Practice: High

Number of Situations: Large

Lack of Ambiguity: Acceptable

Number of Words: Medium

Response Speed: Probably Acceptable

Voice Response:

Oral Content: Medium

Independence from video: High

Justification for Using Voice Technology:

This task is similar to the task of
issuing individual tank fire commands.
It may be more complex in some ways,
but still highly appropriate for
using voice technology.

Potential Application:

CA.71402 Radiotelephone procedures

CA.71304 CEOI procedures

Tasks: 01-5701.20-0001

01-6850.10-0001

01-5839.03-0004

Subject Matter:

Using the automated CEOI and a standard military radio to send and receive coded messages.

Evaluation of Voice Technology Appropriateness

Voice Recognition:

Oral Content: Medium

CBI Appropriateness: High

Practice: High

Number of Situations: Manageable if restricted

Lack of Ambiguity: Medium

Number of Words: Acceptable if restricted

Response Speed: Acceptable

Voice Response:

Oral Content: Medium

Independence from video: High

Justification for Using Voice Technology:

This is very similar to one of the BNCOC task clusters for which SSI is already developing training. It should also be appropriate for the use of voice technology. The justification is similar to that already given.

Potential Application:

SA.80003 Request and Direct Close Air Support

Task: 01-2830.00-6003
01-5840.00-3030

Subject Matter:

Basics of requesting and
controlling close air support
by the USAF.

Evaluation of Voice Technology Appropriateness

Voice Recognition:

Oral Content: High

CBI Appropriateness: Unknown, but may be high

Practice: High

Number of Situations: Probably manageable

Lack of Ambiguity: Unknown, but may be good

Number of Words: Manageable

Response Speed: Probably Acceptable

Voice Response:

Oral Content: Medium

Independence from video: High

Justification for Using Voice Technology:

It is not clear from the POI what
kinds of commands and communications
with air support are taught here. If
the task is similar to calling for
and controlling indirect fire, then
it would be appropriate for the use
of CBI with voice technology.

Appendix B

Potential Indirect Applications

This part of the report presents potential applications of voice technology to armor training that do not meet the criterion of having substantial voice content. However, they all may be tasks in which the best training is done "hands on," with the trainee manipulating objects directly while learning how to assemble, disassemble, maintain, repair, or operate them. In such a situation, voice input and output may be extremely helpful to a trainee by allowing him to interact with the instructional materials without having to remove his hands from the object. It may also be desirable to give the trainee oral directions that do not require him to look at a screen. Voice response systems could allow a trainee to focus all his attention on the task at hand without requiring the use of hands and eyes for tasks unrelated to the material being taught.

The training tasks listed here also vary in their appropriateness for CBI in other ways. For example, a task requiring the manipulation of a small piece of equipment that can be brought into the CBI laboratory is a better candidate for this type of instruction than one dealing with the entire M1 tank. At this time SSI has not attempted to analyze the tasks in Part Two on all possible criteria. If it is desirable to pursue these possibilities, SSI recommends that a demonstration project be instituted to examine the limits of the applicability of voice technology to these tasks.

Indirect BNCOC Applications

Potential Application:

Task Cluster Annex D C23 Use an IM-174 Series
Radiacmeter

Task: 031-503-3003

Subject Matter: Install batteries in and operate the
radiacmeter to read radiation doses.

Potential Application:

Task Cluster Annex D C25 Use an AN/PDR-27 Radiac Set

Task: 031-503-3009

Subject Matter: Set and use the device to monitor
radiation levels.

Potential Application:

Task Cluster Annex E C32 Install and Operate Hot Loop
Wire Communication

Task: 113-588-1064

Subject Matter: Install the communication link and
check its operation by trying it.

Potential Application:

Task Cluster Annex E C33 Construct Field Expedient
Antennas

Task: 113-596-1069

Subject Matter: Erect the antenna and complete a radio
check using it.

Potential Application:

Task Cluster Annex I WPN4 M1 Commander's Weapon
Station

Tasks: 071-313-3474
171-126-3002
171-126-3003

Subject Matter: Prepare and maintain the tank
commander's weapon station.

Potential Application:

Task Cluster Annex I WPN 5 Boresight and System
Calibrate the Main Gun
on an M1 Tank

Tasks: 171-126-1053

Subject Matter: Prepare, maintain, and sight the main
gun and its fire control system.

Potential Application:

Task Cluster Annex I WPN6 Boresight and Zero a Caliber
50 M2 HB Machinegun on an M1
Tank

Tasks: 071-313-3476
071-313-3475

Subject Matter: Boresight and zero the Caliber 50
machinegun.

Indirect ANCOC Applications

Task Numbers Unavailable from POI

Potential Application:

WN.22508 (19K and 19E) Tank Machineguns

Subject Matter: Load, unload, clear, assemble,
disassemble, operate, and maintain
the M240, M2, and M85 machineguns.

Potential Application:

CN.92104 Operation/Maintenance of the AN/VRC-12 Radio
and Associated Equipment

Subject Matter: Perform maintenance checks and
services and troubleshoot the
communications system.

Potential Application:

MN.51404 (19K) Turret Hydraulic Subsystem

Subject Matter: Check and adjust all parts of the
subsystem.

Indirect AOB Applications

Potential Application:

MA.40104 BII-M60A3 Tank

Task: 01-1211.00-1039-D

Subject Matter: Perform preventive maintenance on the M60A3 BII.

Potential Application:

MA.65005 Operating Fundamentals, M60A3 Tank

Tasks: 01-1211.00-1013-D
01-1211.00-1028-D
01-1211.00-1033-D
01-1211.00-1037-D
01-1211.00-1014-D
01-1211.00-1029-D
01-1211.00-1046
01-1211.00-1038-D

Subject Matter: Starting and stopping procedures, instrument interpretation, tank driving, safety procedures, escape and evacuation for the M60A3.

Potential Application:

MA.40508 Turret Preventive Maintenance Checks and Services, M60A3

Tasks: 01-1211.00-1050-D
01-1211.00-1016

Subject Matter: Perform preventive maintenance and troubleshooting on the periscopes and optics, fire control system, and turret of the M60A3 tank.

Potential Application:

SA.20702 M25A1 Protective Mask

Tasks: Unavailable in POI

Subject Matter: Maintain, put on, remove, and store the protective mask.

Potential Application:

WA.20208 Turret, Armament Controls, and Equipment

Tasks: 01-1211.00-1007-D
01-1211.00-1004-D
01-1211.00-1001-D
01-1211.00-1008-D
01-1211.00-1009-D
01-1211.00-1007-D
01-1211.00-1010-D
01-1211.00-1011-D
01-1211.00-1004-D
01-1211.00-1012-D

Subject Matter: Prepare, maintain, install, remove, and secure the tank commander's, gunner's, and loader's weapon stations.

Potential Application:

WA.20808 M68 Gun Mechanical Training

Tasks: 01-1222.00-1003-D

Subject Matter: Perform operator maintenance on the main gun and breechblock of the M60A3 tank.

Potential Application:

WA.21208 Tank Machineguns, M60A3

Tasks: 01-1233.00-1002-A
01-1233.00-1004-A
01-1233.00-1009-A
01-1233.00-1010-A
01-1233.00-1019

Subject Matter: Perform operator maintenance on, load, clear, and perform immediate action on a Caliber 50 and an M240 machinegun and belted ammunition.

Potential Application:

WA.21612 Prepare to Fire, M60A3

Tasks: 01-1222.00-1001-D
01-1233.00-1003-D
01-1233.00-1011-D
01-1211.00-1004-D
01-1211.00-1005-D
01-1211.00-1006-D
01-1211.00-1031
01-1211.00-1027-D

Subject Matter: Boresight, system calibrate, zero, perform preventive maintenance checks and services, and operate and maintain the main gun, Caliber 50 and M240 machineguns, and smoke grenade launchers on an M60A3 tank.